PROJECT NAVIGATOR, LTD.

March 11, 2015

Mr. Philip Allen
Remedial Project Manager
USEPA
1445 Ross Ave.
Suite 1200
Dallas, TX 75202-2733

RE: Submittal of Response to EPA and TCEQ Comments on Feasibility Study
Patrick Bayou Superfund Site – Deer Park, TX

Dear Mr. Allen:

On behalf of the Patrick Bayou Joint Defense Group (JDG) and pursuant to the Administrative Settlement Agreement and Order on Consent (AOC) for Remedial Investigation/Feasibility Study (RI/FS) at the Patrick Bayou Superfund Site in Deer Park, TX, we are pleased to submit the JDG's responses to EPA and TCEQ comments on the Draft Feasibility Study.

Should you have any questions please feel free to contact me at 919-539-1928 or at bobp@projectnavigator.com.

Sincerely,

s/R Piniewski

Robert Piniewski
Project Coordinator

cc: Satya Dwivedula - TCEQ
Patrick Bayou JDG

9595189

USEPA Comments and Responses Matrix for the Patrick Bayou Draft Feasibility Study (February 17, 2015)

Comment No.	Section	Page	Line	Comment	Response to Comment - Proposed Revision
1	2.4	8		Ecological Conditions: The discussion “monitored natural recovery” seems to be premature and would be more appropriate in Section 4.2.2 Monitored Natural Recovery.	Noted – will address as needed.
2	3.4.3	34		Protected Species Requirements: The fulfillment of the Endangered Species Act (ESA) requires a formal Section 7 consultation with the federal natural resource trustees (i.e., Departments of Interior and Commerce).	Noted – will address as needed.
3	4.2.4	52		Treatment: The mixing or tilling of activated carbon (AC) into the top 4 to 6 inches of surface sediments could be difficult to its low density and near neutral buoyancy.	This technology has been demonstrated at several sites (including those with conditions similar to Patrick Bayou) and we can expand the discussion of those technologies.
4	4.2.5	53		Removal: Sediment removal was considered only as a method to maintain hydraulic capacity of the bayou. Sediment removal also should be considered as a standalone remedy as well as a supplement to other technologies. Including sediment removal alternative would increase the range of alternatives evaluated in the FS.	Large scale dredging was evaluated and not selected as a preferred remedial technology in Patrick Bayou because of the potential exposure and transport of higher concentration materials at depth to surface water and surface sediments, dredge residual issues, and dewatering, transport and disposal limitations. The text can be expanded upon more strongly to discuss the conclusions of the *Remedial Alternative and Technology Screening Report* (Anchor QEA 2013).
5	4.3.3	60		Alternative 3 – Monitored Natural Recovery, SMA-1 Capping, SMA-2 through SMA-6 Treatment: The mixing of AC into the top 4 to 6 inches of surface sediments could be difficult to its low density and near neutral buoyancy.	This technology has been demonstrated at several sites (including those with conditions similar to Patrick Bayou) and we can expand the discussion of those technologies.
6	5.3.2.1	70		Long-term Effectiveness: The treatment of Sediment Management Areas (SMA)-2 through SMA-6 without a cap (e.g., articulated concrete block mat (ACBM)) may not be sufficiently durable to provide long-term permanence.	The advantage of the treatment alternatives versus an ACBM cap is that the benthic habitat we are trying to protect remains viable in the treatment alternatives. The ACBM would essentially remove that habitat, which would then need to be reestablished over time as the ACBM silts in. The treatment alternative can be presented so that in an adaptive management approach we could implement the treatment option, and monitor it. Future ACBM capping or additional treatment could be performed in select areas if required based on the post-treatment monitoring data.
7	6.1.1	79		Overall Protection of Human Health and the Environmental: The document states that Alternative 4 is estimated to reduce risks within 10 years following completion of construction. This statement is misleading since the exposure pathway will be considered to be incomplete at the completion of construction. Both Alternative 3 and 4 are estimated to meet the Texas state water quality standard within 1 to 2 years.	Will modify as needed.
8	6.2.1	80		Long-term Effectiveness: Areas SMA-2 through SMA-6 would appear to be more vulnerable in Alternative 3 than in Alterative 4. Alterative 4 provides for a cap (e.g., ACBM) that would appear to provide long-term permanence.	The advantage of the treatment alternatives versus an ACBM cap is that the benthic habitat we are trying to protect remains viable in the treatment alternatives. The ACBM would essentially remove that habitat, which would then need to be reestablished over time as the ACBM silts in. Alternative 4 may provide for long-term structural permanence, but it does not provide for long-term habitat enhancement, and is therefore not as effective as the treatment alternatives over the long-term in our assessment. We should be able to dose the treatment areas and monitor them to maintain those alternatives as viable options over the long-term.

ACRONYMS AND ABBREVIATIONS

AC activated carbon
ACBM articulated concrete block mat
ESA Endangered Species Act
SMA Sediment Management Areas

REFERENCES

Anchor QEA, 2013. Remedial Alternatives and Technology Screening Report. Patrick Bayou, Superfund Site, Deer Park, Texas. Prepared for U.S. Environmental Protection Agency and the Patrick Bayou Joint Defense Group. September 2013.

Comment No.[1]	Section	Page	Line	Comment	Category - Response to Comment - Proposed Revision
1				Please revise the remediation action objective (RAO) for polychlorinated biphenyls (PCBs) to 0.64 nanograms per liter (ng/L) or background (if higher). Also, please consider 0.025 micrograms per liter (µg/L) as the RAO for mercury. We approved the Remedial Investigation (RI) report with the understanding that the recently-revised (adopted by the TCEQ on February 12, 2014) Texas Surface Water Quality Standards (TSWQS) would be considered during the Feasibility Study (FS) phase; but they weren't considered in this report. Please see Attachment B for a copy of our communication at the conclusion of the RI phase. Rationale for our recommended RAOs is provided below. a. The tidal portion of the Patrick Bayou is a part of the Houston Ship Channel Tidal (designated Segment No. 1006), per Appendix C in Title 30 Texas Administrative Code (TAC) §307.10; b. The tidal portion of Patrick Bayou would generally be considered as a tidal river or an estuary; c. Unless specifically exempted, all designated segments, estuaries, and tidal rivers are considered sustainable fisheries, per 30 TAC§307.6(d)(5); d. Based on items a, b, and c above, water quality standards for the protection of human health are applicable to Patrick Bayou; e. The surface water standard for PCBs for the protection of human health is 0.64 ng/L per Table 2 in 30 TAC §307.6(d)(1). f. The surface water standard for mercury in salt water for the protection of human health is 0.025 µg/L per Table 2 in 30 TAC §307.6(d)(1). g. Per Sediment and Surface Water Contaminant of Potential Concern Delineation Data Report dated May 2010, total mercury was detected in 19 of the 22 surface water samples at the site. The highest estimated concentration of total mercury was reported at Station PB006 during the low-tide sampling event, at 0.240 µg/L; this concentration is an order of magnitude greater than the standard for human health protection. h. Table A-2 in the "Baseline Ecological Risk Assessment (BERA)" reported 16 estimated concentrations for total mercury in surface water at the site, with an average concentration of 0.12 µg/L. i. Human health criteria for PCBs and mercury are Applicable or Relevant and Appropriate Requirements (ARARs). j. Patrick Bayou is impaired and is listed on Texas' Section 303(d) list (per federal Clean Water Act). The listings are for mercury in water (first listed in 1998), PCBs in edible tissue (first listed in	***Water Quality Criteria General Response*** The Texas Commission on Environmental Quality's (TCEQ) comments suggest that the human health-based criterion for PCBs, dioxins and furans, and mercury are applicable to Patrick Bayou based on the general principle that all Texas bays, estuaries, and tidal rivers are considered to have sustainable fisheries. We disagree with this broad interpretation and, to clarify, present the following detailed rationale: TCEQ conducted its triennial review of the Texas Surface Water Quality Standards (TSWQS) found at 30 Texas Administrative Code (TAC) Chapter 307. TCEQ's proposed revisions to the TSWQS were published in the September 13, 2013, edition of the Texas Register.[4] The formal public comment period closed on October 24, 2013, and the final revisions were adopted by TCEQ in 2014. Included in the TCEQ's revisions are amendments to Table 2 in 30 TAC § 307.6(d)(1) (relating to Criteria in Water for Specific Toxic Materials; Human Health Protection) as they relate to Polychlorinated Biphenyls (CASRN 1336-36-3) (PCBs), dioxins and furans, and mercury.[6] It should be noted that TCEQ did not propose any amendments to Table 1 in § 307.6(c)(1) of the same regulations (relating to Criteria in Water for Specific Toxic Materials; Aquatic Life Protection) in relation to these chemicals.[7] Table 1 establishes the specific numerical criteria for protection of aquatic life from acute or chronic toxicity and applies to most water bodies in the State (e.g., chronic criterion of 0.03 µg/kg for PCBs in saltwater);[8] whereas Table 2 establishes the criteria for protection of human health and applies more narrowly to surface waters that are designated or used for public drinking water supplies, or which have sustainable fisheries.[9] The proposed amendments to Table 2 (i.e., human health protection) for PCBs, dioxins and furans, and mercury are the result of TCEQ's broader decision to no longer express the numerical criteria for several highly bioaccumulative pollutants as concentrations in fish tissue, but rather as water column concentrations.[10] The conversion from a fish tissue-based to water column-based concentration is accomplished by dividing the relevant fish tissue concentration by the relevant bioconcentration factor (BCF) which yields the water column concentration. The TSWQS currently identify three San Jacinto River Basin segments comprising the Houston Ship Channel: Segment No. 1005 (Houston Ship Channel / San Jacinto River Tidal); Segment No. 1006 Houston Ship Channel Tidal); and Segment 1007 (Houston Ship Channel / Buffalo Bayou Tidal).[12] Patrick Bayou is physically located within Segment No. 1006. TCEQ is proposing a minor revision to Segment No. 1006, but it will simply add an inclusive reference to "Old River."[13] TCEQ's comments suggests that the human health-based criterion for PCBs, dioxins and furans and mercury are applicable to Patrick Bayou because 30 TAC § 307.6(d)(5)(D) provides that all bays, estuaries, and tidal rivers are considered to have sustainable fisheries. It should be noted, however, that § 307.6(d)(5) more specifically provides as follows: "The following waters are considered to have **sustainable fisheries**: (A) **all designated segments listed in Appendix A of §307.10 of this title, unless specifically exempted;** (B) perennial streams and rivers with a stream order of three or greater, as defined in §307.3 of this title (relating to Definitions and Abbreviations); (C) lakes and reservoirs greater than or equal to 150 acre-feet or 50 surface acres; (D) **all bays, estuaries, and tidal rivers; and** (E) **any other waters that potentially have sufficient fish production or fishing activity to create significant long-term human consumption of fish."** (Emphasis added). Similarly, 30 TAC § 307.3(67) defines the term "sustainable fisheries" as follows: "Descriptive of water bodies that **potentially have sufficient fish production or fishing activity to create significant long-term human consumption of fish**. Sustainable fisheries include perennial streams and rivers with a stream order of three or greater; lakes and reservoirs greater than or equal to 150 acre-feet or 50 surface

[1] Note that the comment order has been re-arranged to group comments that reflect similar subjects or issues (e.g., benthic risk, water quality) in order to provide responses that may address more than one comment or apply to several comments. The original comment number as provided in TCEQ's response letter to USEPA dated December 19, 2014 are included in column one for cross-reference to the original comment.

<table>
<tr><th>Comment No.[1]</th><th>Section</th><th>Page</th><th>Line</th><th>Comment</th><th>Category - Response to Comment - Proposed Revision</th></tr>
<tr><td></td><td></td><td></td><td></td><td>2002), toxicity in sediment (first listed in 2000), and dioxins in edible tissue (first listed in 1996).</td><td rowspan="4">acres; all bays, estuaries, and tidal rivers. Water bodies that are presumed to have sustainable fisheries include all designated segments listed in Appendix A unless specifically exempted.” (Emphasis added). Patrick Bayou lies within Segment 1006 of the Houston Ship Channel and is specifically exempted in Appendix A. It is important, therefore, to consider the extent to which Appendix A (relating to Site-specific Uses and Criteria for Classified Segments) contains any potentially applicable exemptions. Significantly, the Houston Ship Channel Segment Nos. 1006 and 1007 are the only classified segments for which the TSWQS do not designate any applicable recreational, aquatic life, or domestic water supply use, and for which navigation and industrial water supply are the only applicable designated uses. Additionally, the two classified segments contain a unique footnote which provides that “chronic numerical toxic criteria and chronic total toxicity requirements apply to Segments 1006 and 1007.” Such site-specific uses and criteria are in direct conflict with the concept of a sustainable fishery, such that the numerical human health-based PCB criteria from Table 2 of 30 TAC § 307.6(d)(1) are not reasonably applicable.[14] The chronic aquatic life criteria for saltwater from Table 1 of 30 TAC § 307.6(c)(1) appears to remain applicable, however.

Finally, it is noted that TCEQ is not proposing to amend the applicability provisions of the referenced numerical human health criteria other than simply expanding the existing phrase public drinking water supplies to specifically include all surface water bodies that are either identified as having a public drinking water supply use in Appendix A or identified as a sole-source drinking water supply in Appendix B.[15] Such revisions do not implicate Patrick Bayou or Segment No. 1006, which is not a public drinking water supply as discussed above.

Footnotes:
[1] The TSWQS currently identify three San Jacinto River Basin segments comprising the Houston Ship Channel: Segment No. 1005 (Houston Ship Channel / San Jacinto River Tidal); Segment No. 1006 Houston Ship Channel Tidal); and Segment 1007 (Houston Ship Channel / Buffalo Bayou Tidal). See 30 TAC § 307.10(3) (relating to Appendix C - Segment Descriptions).
[2] TCEQ Interoffice Memorandum from Technical Program Support Team, Division Support Section, Remediation Division, to Superfund Section, Remediation Division, dated October 10, 2013, regarding Patrick Bayou Remedial Investigation Report, prepared for Patrick Bayou Joint Defense Group by Anchor QEA, LLC.
[3] Ibid, at General Comment No. 2, pp. 1 – 2.
[4] http://www.sos.state.tx.us/texreg/archive/September132013/Proposed%20Rules/30.ENVIRONMENTAL %20QUALITY.html#74
[5] http://www.tceq.texas.gov/assets/public/waterquality/standards/tswqs_2014/TimelineAdoption.pdf
[6] http://www.sos.state.tx.us/texreg/archive/September132013/tables-and-graphics/201303620-2.pdf
[7] http://www.sos.state.tx.us/texreg/archive/September132013/tables-and-graphics/201303620-1.pdf
[8] See 30 TAC § 307.6(c) (relating to Toxic Materials; Specific Numerical Aquatic Life Criteria).
[9] See 30 TAC § 307.6(d) (relating to Toxic Materials; Specific Numerical Human Health Criteria).
[10] See 30 TAC § 307.6(c)(10) and associated preamble discussion (“human health criteria for 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, dioxins/furans, mercury, and <u>polychlorinated biphenyl</u>s, which were previously expressed as fish tissue- based concentrations, <u>are revised to water column-based concentrations</u>”). (Emphasis added).
[11] See Current footnote “+” for PCBs which provides: “An assumed BCF of 3.12E4 is used to translate the tissue- based criterion to a water column criterion for the purposes of evaluating TPDES permittees. BCF value taken from Ambient Water Quality Criteria for Polychlorinated Biphenyls; October 1980; EPA 440/5-80-068.”
[12] 30 TAC § 307.10(3) (relating to Appendix C - Segment Descriptions).
[13] The revised description of Segment No. 1006 will provide as follows: “Houston Ship Channel Tidal - from the confluence with the San Jacinto River in Harris County to a point immediately upstream of Greens Bayou in Harris County, including tidal portions of tributaries and <u>Old River</u>.” (Emphasis added).
[14] Additionally, under the legal doctrine of lex specialis derogat legi generali, the regulatory provision governing a specific subject matter (i.e., Houston Ship Channel aquatic use designation) should supercede the lesser specific general provision (i.e., broad aquatic use designation for bays, estuaries, and tidal rivers across the state generally).
[15] See proposed 30 TAC § 307.6(d)(2)(A) (i.e., implicating only Column A in Table 2 relating to surface waters that are designated or used for public drinking water supplies) which provides: “These criteria apply to surface waters that are designated or used for public drinking water supplies, <u>including all water bodies identified as having a public drinking water supply use in Appendix A of this chapter or as a sole-source surface drinking water supply in Appendix B of this chapter.</u>”</td></tr>
<tr><td>9</td><td>Section 3.1</td><td></td><td></td><td>Please revise the third bulleted item in Section 3.1 (Remedial Action Objectives) to state “Reduce PCB concentrations in surface water to the higher of the background concentration or 0.64 ng/L [human health ‘fish only’ criterion in the Texas Surface Water Quality Standards (TSWQS)].”</td></tr>
<tr><td>10</td><td>Section 3.1</td><td></td><td></td><td>Please include a fourth bulleted item in Section 3.1 (Remedial Action Objectives) to state “Reduce mercury concentrations in surface water to 0.025 µg/L (human health “fish only” criterion in the TSWQS).”</td></tr>
<tr><td>14</td><td>Section 3.4.1.1</td><td></td><td></td><td>In Section 3.4.1.1 (Section 303 and 304 of the Clean Water Act and Texas Surface Water Quality Standards), please specify that the lowest surface water quality standards (per TSWQS adopted by the TCEQ on February 12, 2014) for PCBs and mercury are 0.64 ng/L and 25 ng/L respectively.</td></tr>
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2	Section 3.2.2			The preliminary remediation goal (PRG) for benthos should be set at a mean Probable Effects Level-Quotient (PEL-Q) of 3.07, instead of 7.56 (see Table 3-1). This is the lowest PEL-Q for any station TCEQ determined to represent a probable risk to the benthic community based on the weight of evidence (WOE) analysis. Other comments on PEL-Q are provided below. a. Section 3.2.2 in the draft FS identified a PRG for benthic risk. The FS proposed a mean PEL-Q of 7.56 as the benthic PRG, which is the lowest mean PEL-Q for indeterminate risks based on the sediment toxicity line of evidence. The mean PEL-Q was calculated as the average of PEL-Qs for PCBs, polycylic aromatic hydrocarbons (PAHs), bis (2-ethylhexyl) phthalate (BEHP), and lead. This was identified in the toxicity model as being the best fit for the toxicity data. Because the PEL-Q for BEHP and lead were relatively low, a mean PEL-Q of 7.56 still reflects relatively high concentrations of PCBs, PAHs, or both. For example, the site median PEL-Qs (using the 2009 samples shown in Appendix A of the BERA) for lead, BEHP, and total PAHs are 0.32, 0.47, and 1.00, respectively. Assuming that the PAH, BEHP, and lead concentrations were set at these levels, the proposed PRG of 7.56 would allow a PEL-Q of 28.4 for PCBs alone. While this is an improvement over the current site average PEL-Q of 67 for PCBs, it is still 28 times the screening level for PCBs. Since the selected PEL-Q PRG is based on an optimized model, a more realistic PEL-Q of 3.07 is appropriate. b. Please provide a brief summary of other federal superfund sites at marine locations that have used the PEL-Q as the PRG. Please indicate the selected threshold and the chemicals or chemical groups included in this threshold.	***Benthic Risk/PEL-Q*** As demonstrated in the United States Environmental Protection Agency (USEPA)-approved BERA Report (Anchor QEA 2013a) and the Draft FS Report (Anchor QEA 2014), the Joint Defense Group (JDG) is confident that a mean PEL-Q of 7.56 is protective of the benthic community at the site and would achieve the benthic risk RAO. However, given the concerns expressed by TCEQ in this comment, and the JDG's desire to continue to work cooperatively with the USEPA and TCEQ, the JDG is willing to accept a compromise position. The JDG therefore proposes to utilize the more conservative lowest optimized mean PEL-Q characterized as probable risk to the benthic community in the BERA Report (Anchor 2013a) (i.e., 4.47 at Station Q) as the PRG for the site. This approach is based on the following rationale: 1. This PRG is based on the WOE risk characterization presented in the USEPA-approved BERA Report (Anchor QEA 2013a) which considers all three lines of evidence (LOEs), including benthic community data (TCEQ Comment #11). 2. This PRG provides a more conservative narrative definition of risk since it is based on a lower probable risk threshold, rather than a higher indeterminate threshold. Although probable risks to the benthic community were identified at mean PEL-Qs as low as 4.47, indeterminate risks were observed at mean PEL-Qs up to 7.56; indicating that the probability of adverse risks to the benthic community is less certain within this range and that selection of a mean PEL-Q value of 4.47 as the PRG will result in conservative risk management decisions in areas that fall within this range of mean PEL-Qs. 3. Accepting the lowest mean PEL-Q representing probable risk as the PRG would lower the "acceptable" range of concentrations for all four chemicals of concern (COCs) in the model (TCEQ Comment #2b). The following examples provide a brief summary of other USEPA-lead or Superfund sites at marine locations where similar approaches were utilized to develop a PRG for benthic risk: a. Calcasieu Estuary, Lake Charles, Louisiana - The Bayou d'Inde Area of Concern within the Calcasieu Estuary is an example of an USEPA-lead site where an integrated chemical metric was used to quantify potential risks to the aquatic receptor group, including the benthic community. At this site, a mean Probable Effects Concentration Quotient (PEC-Q) metric was used that included a metals component (7 individual metals), Total PAHs (the sum of 13 PAH compounds comprised Total PAHs), and PCBs. The results of site-specific toxicity tests in the Study Area and in reference areas (i.e., 28-day chronic bioassays with *Hyalella azteca*) were used to evaluate the relationship between the mean PEC-Q metric and risks to the benthic community. A mean PEC-Q value of 0.33 represented the low risk to indeterminate risk threshold, defined as a reduction in survival of 10% relative to the lower 2.5 percentile of the bioassay results on reference area sediments and a value of 0.56 represented the indeterminate to high risk threshold, defined as reduction in survival of 20% relative to the lower 2.5 percentile of the reference area results. It is important to recognize that values from one site may not be comparable to another site because of site-specific conditions that affect the bioavailability of chemicals and the interpretation of toxicity data relative to reference data. This approach was approved by USEPA Region 6. b. Onondaga Lake, Syracuse, New York - At the Onondaga Lake National Priorities List site, a mean PEC-Q approach was used in the Feasibility Study to identify sediments posing potential adverse risks to the benthic community. The mean PEC-Q was developed using a site-specific sediment toxicity and chemistry dataset consisting of 46 chemicals and 10-day chironomid and amphipod toxicity tests. Using the mortality results, five site-specific sediment effect concentrations (SECs) were derived, relying on methods that had been previously published in the scientific literature and government reports, including: Effects Range Low/Effects Range Median (ERL/ERMs) defined in Long and Morgan 1991, Threshold Effects Level/Probable Effects Level (TEL/PELs) as defined by MacDonald et al. 1996, and Apparent Effects Threshold (AETs) as defined by Barrick et al. 1988. The PEC was derived as the geometric mean of the five SECs for each chemical. For each sediment sample, the mean PEC-Q was calculated using each of the 46 PECs. Next, exposure/response relationships were examined to determine if there was an inflection point in the mean PEC-Q where the degree of response (percent mortality) indicated an initial noticeable upturn or increase. The inflection point was identified as the lower end of a range in mean PEC-Q values in which mortality first showed a consistent increase. The lower end of this range in values was then proposed as the critical value below which toxicity attributable to the mixtures of chemicals in the lake sediments would not be expected. A series of optimization steps was performed by evaluating different chemical groups (i.e., BTEX [benzene, toluene, ethylbenzene, xylene], chlorinated benzenes, PAHs, PCBs, miscellaneous organics, and metals) to identify chemicals and chemical groups that best predicted mortality. This led to an optimized model using 23 of the 46 chemicals in the final model. Finally, a critical mean PEC-Q value was established for both the chironomid and amphipod tests. Based on the inflection points identified in the exposure/response

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					relationships for the 10-day chironomid and amphipod sediment toxicity tests, critical mean PEC-Qs of 1 and 2, respectively, were identified. USEPA Region 2 approved this approach for identifying sediment management areas (SMAs) in the FS. Similar to the Calcasieu Estuary, it is important to recognize that these values should not be compared to the Patrick Bayou site. Of primary difference is the use of a site-specific sediment effects value at Onondaga Lake which was not used at Patrick Bayou, which relied on published values that did not account for site-specific variables such as bioavailability in the quotient values.
3				We commented on the conclusions of the benthic risk assessment via memos dated May 15, 2013 and October 10, 2013. Copies of these memos are provided in Attachment B. We request the EPA to review and consider information in these memos. Specifically, we request EPA to classify stations 3 and 5 as "probable risk" and stations S, G, and E as "indeterminate risk."	***Benthic Risk/PEL-Q*** A review of the comments provided by TCEQ would not result in the reclassification of the stations as indicated in the current TCEQ comment provided. Specifically, station 5 would not be classified as probable risk using the rationale provided by TCEQ and using the classification framework provided in Section 8.1.6 of the BERA Report (Anchor QEA 2013a). In TCEQ's May 15, 2013 comment letter, Comment #1 specifically discussed each LOE (chemistry, toxicity, and benthic community) with respect station 5 and concluded for each LOE, that station 5 should have been classified as indeterminate toxicity. Under the BERA risk characterization scheme, this station would be classified as indeterminate. Thus, the conclusion and subsequent request to classify station 5 as probable risk appears to be in error. Presumably, classifying station 5 as probable risk is the basis for TCEQ's request to set the PRG for mean PEL-Q at 3.07, the mean value at station 5. Thus, it is important to recognize, that under TCEQ's proposed reclassification of stations using the WOE approach, the lowest mean PEL-Q classified as probable risk would remain 4.47 (Station Q). The USEPA-approved BERA Report (Anchor QEA 2013a) currently considers station 5 to represent indeterminate risk to the benthic community. With respect to stations 3, S, G, and E, reclassification of these stations would not affect the outcome of the current analysis of alternatives as presented in the Draft FS Report. Assuming that the PRG is accepted to be 4.47 based on station Q as the lowest probable risk location, SMAs and alternatives would be developed using the RI surface sediment chemistry data collected subsequent to 2009. Thus, reclassification of these stations for purposes of mapping current benthic risk areas would not be necessary.
7	Section 2.6.2			In Section 2.6.2 (Distribution of Indicator Chemicals), please acknowledge that the utilization of indicator chemicals does not infer that these were the only chemicals or chemical groups that pose a risk to benthos. This group of chemicals of potential concern (COPC) was carried forward into the BERA as it was identified in the BERA work plan for use in the optimized mean PEL-Q model. This model was intended to be the primary tool for evaluation of the benthic invertebrate exposure pathway in the BERA. Other chemicals could pose a significant risk to benthic invertebrates in Patrick Bayou. In addition to these, a number of other COPCs were identified in the BERA work plan. Mercury concentrations in particular are extraordinarily high (23.5 mg/kg average mercury concentration; Table 5, May 2010 Sediment and Surface Water COPC Delineation Data Report). In comparison, mercury concentrations in the upstream culvert sediment samples (see Upstream Patrick Bayou Characterization Data Report, February 2012) ranged between 0.01 and 0.061 mg/kg.	***Benthic Risk/PEL-Q*** Although the causative nature of observed toxicity or other potentially adverse measurement endpoint observations often cannot be clearly defined in sediment or aquatic systems, the optimized mean PEL-Q is the best integrated chemical metric for estimating adverse effects to the benthic community. Further, given the predominant contribution of PCBs to the overall metric, there is reason to believe that PCBs may be the primary risk driver for the observed benthic toxicity. Thus response actions focused on lowering or mitigating the mean PEL-Q, and in particular PCBs, would be expected to lower the overall risk to the benthic community in Patrick Bayou (i.e., see TCEQ Comment #2a with regard to the relative contribution of PCBs to the mean PEL-Q). Although other chemical and physical stressors to the benthic community may be present in Patrick Bayou, their effect on the benthic community assessment endpoint cannot be quantified and, therefore, response actions cannot be taken to address such impacts, if any.
8	Section 3.1			In the first bulleted item in Section 3.1 (Remedial Action Objectives), please (a) clarify that the COPCs are not limited to the indicator chemicals used in the model [PCBs, PAHs, lead, and bis (2-ethylhexyl) phthalate (BEHP)] and (b) explicitly specify that COPCs other than the indicator chemicals could potentially influence the response action. Within the BERA, the mean PEL-Q model was carried through a series of model optimization and calibration steps in an attempt to improve the model performance and to identify the most appropriate model for characterizing risk to the benthic community. COPCs that did not contribute significantly to the predictive ability of the model were removed from the PEL-Q calculation. In the end, the PEL-Q model was	***Benthic Risk/PEL-Q*** The RAOs presented in Section 3.1 are consistent with those presented in the USEPA-approved RI Report (Anchor QEA 2013b), BERA Report (Anchor QEA 2013a), and *Baseline Human Health Risk Assessment Report* (Anchor QEA 2012). No additional information has been developed during the FS to warrant any modification of the RAOs. Similar to response to Comment #7, although other COPCs were identified in the USEPA-approved BERA Work Plan (Anchor QEA 2011a) and BERA for the benthic community, their contribution, if any, to adverse risks on the benthic community cannot be quantified. Thus RAOs to address such risks cannot be developed. However, any reduction in the mean PEL-Q (through proposed response actions) should lower the overall risk to the benthic community in Patrick Bayou.

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				carried forward using the mean of the individual PEL-Qs for total PAHs, total PCBs, lead, and BEHP. This does not mean that the remaining Patrick Bayou sediment COPCs are not causing toxicity to benthic invertebrates in the sediments. COPC other than indicator chemicals were not used in the PEL-Q calculation because their inclusion did not result in satisfactory model performance. Many COPCs other than the indicator chemicals are present at the site at significantly elevated concentrations.	
11	Section 3.2			It appears that the WOE approach in Section 3.2 (Benthic Risk RAO: Preliminary Remediation Goals) ignored significant components of the risk characterization for benthos. Please revise this section to address the following concerns, or revise the PRG, or both. The mean PEL-Q metric was used as one of three lines of evidence (LOEs) within a WOE framework in the BERA to characterize risk to the benthic community. Based on the WOE approach, the BERA identified that (a) incremental site-related risks to the benthic community are probable at 3 of the 12 sample locations and (b) risk to the benthic community is indeterminate at 4 of the 12 sample locations. Co-located bulk sediment chemistry, bioassay, and benthic community data were used from 12 sample locations to evaluate risks to benthos within this WOE approach. As correctly summarized in this section, the RI report (in Section 7.25) concluded that remedial alternatives that lower the overall site and sub-area risk for areas that are characterized as indeterminate and probable risks to benthos should be evaluated in the FS. The discussion goes on to say that to support the remedial alternatives evaluation, the results of the BERA benthic risk assessment were used to identify a mean PEL-Q threshold that would represent the lowest threshold associated with indeterminate sediment risk as defined in the BERA. The lowest mean PEL-Q threshold associated with indeterminate sediment toxicity (i.e., 7.56) was selected as the benthic risk PRG to evaluate remedial alternatives. This PEL-Q was based on the sediment toxicity LOE. The benthic community LOE was not incorporated in this analysis. This disregards the analysis in the BERA, which concluded that the WOE-based risk is classified as probable for Station Q and indeterminate for Stations V, U, and 5. The WOE framework in the BERA was the primary tool for evaluating potential risks to the benthic community in Patrick Bayou. Unless the sediment sampling locations where the PEL-Q exceeded 7.56 coincidentally overlapped the areas represented by stations Q, V, U, and 5, the FS appears to ignore significant components of the risk characterization for benthos.	***Benthic Risk/PEL-Q*** Please see response to Comment #2 which proposes to consider all three LOEs in the BERA Report (Anchor QEA 2013a) for setting the benthic risk PRG based on the mean PEL-Q.
12	Section 3.2.1 Section 3.2.2	 Page 30		In Section 3.2.1 (Summary of BERA Risk Characterization), please consider that the TCEQ recommended that the BERA reflect additional sample locations that should be considered probable or indeterminate in terms of potential risks to the benthic community. The discussion on page 30 in Section 3.2.2 (Identification of PRG for Benthic Risk) states that the model will likely be updated using new baseline data in the pre-design phase of the project. How will the model be updated?	***Benthic Risk/PEL-Q and Long-term Monitoring Design*** Sediment samples will be collected for short- and long-term monitoring to delineate the extent of the SMAs and to ensure that response actions are effective. Although sampling density will vary, an adequate sample set will be identified to cover both areas identified as monitored natural recovery (MNR) and for activated carbon (AC) treatment. The mean PEL-Q model would not be updated. Rather the baseline surface sediment chemistry map would be updated during the pre-design phase with additional surface sediment chemistry data. The text will be modified to clarify this.

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<tr><th>Comment No.[1]</th><th>Section</th><th>Page</th><th>Line</th><th>Comment</th><th>Category - Response to Comment - Proposed Revision</th></tr>
<tr><td></td><td></td><td></td><td></td><td>Would this result in a new evaluation of the areas above the PRG and corresponding revision to the SMAs? Will sediment sampling be conducted on the same scale as in 2009? We suggest collecting sediment samples as close as possible to TCEQ former sampling locations 4A and 6A.</td><td>Collection of baseline data could result in revisions to SMAs if conditions have changed. It is anticipated that higher density sampling would occur only in those areas that are identified for active remediation to clearly delineate the SMA boundary. Sampling in SMAs identified as MNR would have relatively lower sampling density.</td></tr>
<tr><td>4</td><td></td><td></td><td></td><td>Analytical data collected at the site since 1994 indicates that the model provided in Appendix A has overestimated the sediment recovery rates. Therefore, please initiate a third-party technical review of the model, and ensure that it is properly calibrated. Before selecting monitored natural recovery (MNR) as a primary remedy, please verify whether or not it is feasible. From our December 15, 2014 conference call, we understand that the EPA agrees with this recommendation and may request the United States Army Corps of Engineers (USACE), the USGS, or an outside engineering firm to review the model. We strongly support this proposal. The following are our specific comments on the model.

a. The model described in Appendix A was used extensively to predict the sediment recovery rates for various areas of the site. It is unclear how the model was calibrated for sediment concentrations. Appendix A discussed model calibration and performance for the prediction of PCB concentrations in the water column over time. Table 4-1 in Appendix A provided 7-year site-wide and 3 to 13-year reach-specific PCB sediment half-life predictions in a scenario with no active remediation. Appendix A stated that “These predicted declines are largely driven by ongoing sedimentation in the Bayou.”

b. The TCEQ has collected data in the lower part of Patrick Bayou since 1994. This corresponds with location PB010, where the predicted half-life is 6 years for sediment PCBs and presumably other contaminants, according to the model. However, based on twenty years of monitoring, TCEQ has not seen any appreciable sediment recovery in Patrick Bayou. For example, the concentration of mercury in sediment in July 1994 was 3.98 mg/kg, and it was 3.69 mg/kg in July 2013. The average mercury concentration (based on 25 monitoring events) in sediment samples from this station was 3.65 mg/kg. Therefore, natural recovery rates predicted by the model are not consistent with the observed data, and the recovery rates appear overestimated.

c. We recommend that the 2009 sediment data be compared to the earlier sediment data to test the accuracy and plausibility of the modeled natural recovery. This could be based on the same reaches that were used in the model (described in Table 4-1).

d. This evaluation should also include other parameters of interest to test the presumption that PCB concentrations are a good surrogate for other chemicals of concern.</td><td>Modeling/MNR
It should be noted that the modeling studies indicate that the rate of natural recovery in Patrick Bayou is largely controlled by sedimentation. The hydrodynamic and sediment transport models (which are used to predict sedimentation rates) were reviewed previously by USEPA and TCEQ, and a third-party review of these models was conducted by Earl Hayter of the USACE (comments were provided by Earl in August 2009). Comments provided by all parties were addressed and the models were revised as necessary. The final Sediment Transport Modeling Report was submitted in September 2011 (Anchor QEA 2011b). Consequently, at this time additional model verification is unwarranted and the model is suitable for use in the Draft FS Report. However, additional model calibration and validation will be performed based on future sampling data (e.g., pre-design work, long-term monitoring).

a. The primary factors affecting sediment PCB concentrations in the model are deposition and erosion, which are driven by calculations from the sediment transport model – as described in Anchor QEA 2011b. That model was calibrated to an extensive dataset consisting of total suspended solids data and net sedimentation rate estimates derived from numerous sediment cores that were dated using radioisotope data. However, there are insufficient sediment PCB data to calibrate the chemical fate and transport model to changes in sediment PCB concentrations over time (i.e., initial sediment concentrations were specified in the model based on the 2009 RI sediment dataset, no additional sediment data that can be directly compared with the 2009 dataset have been collected since that time, and earlier data were not sufficient so support empirical evaluations of sediment trends as discussed in (c) below). Rather, the model was calibrated to match the observed water column spatial patterns in 2009, and the model was then shown to reproduce the observed reduction in water column PCB concentrations between 2009 and 2014 (which is believed to be due in part to reductions in surface sediment concentrations over this period). Specifically, the model (using initial sediment concentrations from 2009) was run for a period of 5 years to account for reductions in surface sediment concentrations that may have occurred between 2009 and 2014 as a result of ongoing sedimentation. This simulation showed good agreement with the water column data collected in 2014 (which were lower than those from 2009), and therefore provides initial validation of the model's predictive ability.

b. Without having a report that documents the methods, number/locations of samples collected, and data analysis/validation results of the mercury sampling described in this comment, the JDG cannot comment on these conclusions. However, as documented in the USEPA-approved BERA Report (Anchor QEA 2013a), mercury does not appreciably contribute to potential site risks. This conclusion is supported by the sediment porewater study data which provide strong evidence that mercury is not bioavailable because it is bound up with sulfides. Further, sampling at one location within the site cannot be used to characterize rates of natural recovery over the entire site. For example, in the immediate vicinity of location PB-010, the sediment transport model predicts that there is variability in deposition rates across the channel at this location, as in other portions of the site (see Figure 2-30 in the Sediment Transport Modeling Report [Anchor QEA 2011b]). Some areas in the region of PB-010 are predicted to experience higher sedimentation rates than others (i.e., near shore areas are predicted to experience higher sedimentation than areas closer to the channel) - this underscores the point that one sampling location cannot be used to draw conclusions regarding rates of recovery over larger areas, or the entire site. To evaluate natural recovery, it is more appropriate to look at site-wide conditions over larger spatial scales, which is what was done in the FS and as part of the MNR modeling documented therein. Furthermore, there are several empirical LOEs that support the model's predictions that natural recovery is occurring in this system. These include (1) radioisotope data from sediment cores collected in 2006 and 2008 that were used to estimate net sedimentation rates (NSRs) at the site – estimated NSR's ranged between 0.15 cm/year and 2.5 cm/year with higher NSR at locations in the upstream portion of the site (see RI Report [Anchor QEA 2013b] Figure 3-17); and (2) the vertical distribution of PCBs in deep sediment cores collected in 2006 – the majority of locations sampled show buried PCB peak concentrations at a depth of 50 to 100 cm below the sediment surface (RI Report [Anchor QEA 2013b] Figure 4-6), which is indicative of ongoing recovery in the system. Buried peak concentrations are also evident in</td></tr>
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					vertical profiles generated for other COPCs (see RI Report [Anchor QEA 2013b] Figures 4-7 through 4-9 for vertical profiles of PAHs, BEHP, and lead, respectively). c. The only earlier sediment PCB datasets collected as part of the RI that are available for such a comparison are the 2006 and 2008 sediment datasets. During model calibration, it was determined that it would be difficult to develop any meaningful comparison between the earlier (2006 and 2008) datasets and 2009 for several reasons, primarily due to differences in the objectives of these sampling programs and the analytical methods employed. The 2006 sediment samples were collected for vertical characterization of sediment COPCs, and were only collected at 14 locations throughout the Site. The 2008 sediment samples were collected to evaluate the surface sediment mixing zone and were only collected at 10 locations. The 2009 dataset is a much larger dataset (46 locations) designed to provide a site-wide understanding of the distribution of COPC concentrations. Reach-by-reach comparisons (as suggested in the comment) would be difficult because in many cases one would be comparing averages based on 1 to 2 samples from 2006 and/or 2008 with averages based on 5 to 10 samples from 2009. Also, point-by-point comparisons are not possible because none of the 2009 locations re-occupied locations from 2006/2008. Also, the 2008 dataset was analyzed using an Aroclor method whereas the 2006 and 2009 datasets were analyzed via congener method – therefore the 2008 dataset is not directly comparable with 2006 or 2009. Lastly, the relatively short time period between collection of these samples (approximately 3 years) precludes any meaningful evaluation of changes in surface sediment PCB concentration over time. d. As described in the Draft FS Report, the chemical fate and transport model focused on simulation of PCBs; this was considered sufficient for purposes of the Draft FS Report because PCBs are a key contributor to sediment PEL-Q and are a driver for surface water quality issues. Further, it is likely that the other sorptive chemicals that contribute to PEL-Q at the site will behave similar to PCBs with respect to natural attenuation due to deposition of clean sediments or immobilization due to sorption by the proposed AC amendments, where applicable.
6	Section 2.5.4			To aid the discussion in Section 2.5.4 (Streambed Characteristics and Sediment Transport), we request spatial and graphical comparison of the erosional areas with the sediment management areas proposed for MNR. The sediment modeling indicates that there are erosional areas in Patrick Bayou. For example, in Section 2.5.4, the text summarizes (from the sediment transport and modeling report) that "*during the 100-year high-flow event (i.e., event with one percent chance of occurring in a given year), net erosion occurs in approximately 65 percent of the total bed area and the majority of the net erosion is less than 6 cm*." The text continues that "*during the two year high-flow event (i.e., event with 50 percent chance of occurring in a given year), net erosion occurs in about 45 percent of the total bed area and erosion depths are less than 2 cm*." The text also states that "*results from natural recovery modeling based on simulation of sediment transport processes indicate that for about 70 percent of the Site, the chemical concentrations in the mixing-zone layer will decrease by one-half of their current concentrations in less than 10 years, assuming "clean" sediment input*." Is there an overlap of the erosional areas and the sediment management areas proposed for MNR? Does the model presume that there would be sufficient time between storms to allow the deposition of new sediment, so that when a storm occurs, there will not be any erosion of contaminated sediment? Or is the presumption that the contaminated sediment will be washed into the Houston Ship Channel and further downstream.	***Modeling/MNR*** Comment #6a: Additional graphical information is neither necessary nor relevant to the evaluation of SMAs proposed for MNR. The effects of episodic erosion during rare floods on the rate of natural recovery within these areas over multi-year periods have been incorporated into the model. Depositional/ erosional areas predicted by the model have been mapped extensively in the *Sediment Transport Model Report* (Anchor QEA 2011b) and were considered in the development of the SMAs. Thus, additional graphical analysis of model results is not warranted. Comment # 6b: Some of the erosional areas predicted to occur during rare flood events overlap with SMAs proposed for MNR. Note that natural recovery can occur in sediment bed areas that are net depositional over multi-year periods but experience episodic erosion during a rare flood. This result is consistent with other lines of evidence that support natural recovery (e.g., radioisotope cores and vertical profiles of PCB concentrations, see response to Comment #4b). Comment #6c: The model predicts sediment erosion, deposition and transport processes throughout Patrick Bayou based on temporal variations of freshwater inflows and sediment loads from the tributaries and tidal conditions in the Houston Ship Channel over multi-year periods. These inputs to the model are based on site-specific data. No presumptions are made about the timing of rare storms or sediment transport processes during a rare storm.

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16	Section 4.1.2.3 Section 4.1.4			In Section 4.1.2.3 (Delineation of Benthic Risk SMAs), the benthic risk SMAs were delineated for areas where natural recovery estimates do not reduce the mean PEL-Q below the PRG within 10 years. Please provide the basis for selecting 10 years as the recovery time threshold. Section 4.1.4 (Summary of SMA Delineation) indicates that the limits of the SMAs and the Natural Recovery Areas will be refined by pre-design baseline data collection and additional model calibration, and this information will be used in an adaptive management process. Please provide a general discussion of the types of information that will be desired for the pre-design baseline data collection.	***MNR – Miscellaneous*** Numerous Records of Decisions (RODs) for other sediment sites use time frames of 10 years and longer for MNR alternatives. We will provide example sites in the revised FS Report. The primary line of evidence for defining the limits of SMAs and natural recovery areas will be bulk sediment chemistry data for PEL-Q constituents. The details of that sampling program will be provided in a pre-design sampling and analysis plan.
18	Section 4.2.2			From Section 4.2.2 (Monitored Natural Recovery), we understand that a program to monitor the natural recovery would be developed during the remedial design phase. Please consider the following comments during the development of the monitoring program. a. Please determine if additional monitoring of any kind would be warranted following episodic weather events. If additional monitoring is required, please specify the nature of events that necessitate this monitoring. b. Please consider all chemicals that could pose a significant risk to the benthic invertebrates in the Patrick Bayou; the optimized mean PEL-Q model considered only PCBs (as Aroclors and congeners), total PAHs, lead, and BEHP as the indicator chemicals. TCEQ provided this comment earlier, during the RI phase. Please be aware that in response to this comment, the Joint Defense Group (JDG) stated that “long term monitoring for benthic toxicity will likely be utilized to ensure that risk to benthos has been adequately addressed as part of the Record of Decision.”	***MNR/Benthic Risk/PEL-Q*** Natural recovery is a process that should be monitored over long timescales to develop valid recovery trends. The natural recovery process may be temporarily interrupted (due to scour) or enhanced (due to deposition of a relatively large incoming sediment load), however, monitoring of natural recovery is focused on long-term trajectories, not short-term disruptions in any such trajectory. Details of the monitoring plan may be discussed as part of the ROD and outlined in the design plans for the preferred remedy.
19	Section 4.2.2			Please note that for multiple media discussed in Section 4.2.2 (Monitored Natural Recovery), we intend to comment on the adequacy of the number of samples and the sampling frequency when the monitoring plans are submitted in the future.	***MNR – Miscellaneous*** Noted.
5	Section 2.6.1			Please discuss the current state of knowledge regarding potential contributions from point sources to the site. Section 2.6.1 states that the point source outfalls do not contribute contaminants to the bayou above “National Pollutant Discharge Elimination System (NPDES) discharge limits or above typical urban background loading.” However, a 1998/99 study (Parsons, 2000) of the outfalls to Patrick Bayou found contaminants in some discharges in amounts that might be above typical urban background loading. For example, Arochlor 1248 was detected in five outfalls, with average concentrations ranging from 5.9 ng/L to 15.2 ng/L (Table 3.8 in Parsons, 2000). These concentrations are higher than the upstream values for PCBs reported in the draft FS. Dioxins, lead, mercury, and other metals were also found in most outfalls.	This data, which is over 15 years old, is not relevant to assess recent or current point sources associated with permitted outfalls to the site. More recent data will be reviewed to support the position that outfalls are not significant ongoing sources of PCBs to the site and this evaluation will be included in the revised FS Report. From a historical context, the range of values cited in the comment do not exceed the TSWQS for total PCBs, and would not necessarily be considered a historical source based on the data presented therein.
17	Section 4.2.1			The institutional controls discussed in Section 4.2.1 (Institutional Controls) do not necessarily offer adequate protection to the people who consume fish from the Houston Ship Channel and the Galveston Bay. This section outlined a number of institutional controls, many of	***Miscellaneous – Institutional Controls*** Text will be revised as appropriate.

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				which are related to the security along the Patrick Bayou and the Houston Ship Channel. The discussion in this section mentions the seafood consumption advisories in the Houston Ship Channel and Galveston Bay. These advisories cannot be viewed as permanent or necessarily effective institutional control. In spite of the advisories, many people still catch and consume fish and crabs. Additionally, advisories are lifted once tissue data indicates that levels have decreased to acceptable concentrations. The text should be revised to reflect the limited effectiveness of the fishing advisories in successfully eliminating the exposure potential.	
20	Section 4.2.2.2			Regarding the information provided in Section 4.2.2.2 (Porewater Monitoring), please specify the reason for deferring porewater sampling and analysis until remedy implementation, while sampling for other media is planned prior to remedy implementation.	The existing bulk sediment data are adequate to define SMAs for benthic risk required for the FS and development of alternatives and porewater sampling is not required prior to remedy application – the assumption is that existing porewater concentrations in those areas are not acceptable based on bulk chemistry data. This approach is consistent with the PEL-Q LOE used in the BERA Report. The use of AC will reduce risk in those areas by lowering the concentration of chemicals that are part of the PEL-Q in porewater which is the primary exposure pathway. Therefore, porewater measurements and comparison to equilibrium partitioning benchmarks as part of the remedy verification is appropriate.
21	Section 4.2.3			If containment is used as a remedy (see Section 4.2.3), please include targeted monitoring contingencies following significant flow events. Please determine the nature of these significant flow events when designing the long-term monitoring program.	See response to Comment #18 above.
22	Section 4.3			Please provide responses to the following comments on Section 4.3 (Assembly of Remedial Alternatives). a. Figure 4-2 displays a process flow diagram for the proposed adaptive management framework. This diagram includes the sequence of sampling, evaluation, and decisions that would be made under all alternatives. Please specify the anticipated timing of the pre-remedial design sampling. b. Per Figure 4-2, the presumption is that the site would continue in a "remedy monitoring" mode under Alternative 2 unless and until there is a decision that natural recovery is not achieving the target surface water or sediment concentrations (as PEL-Q) in a "reasonable time." We understand that all of the proposed remedy alternatives (a) would be implemented in an adaptive management framework and (b) all begin with a decision whether target levels are being met within a reasonable time. How would this approach be different from the sequence under alternatives 3 and 4? In other words, how is the waiting time (before SMA refinement and remedy implementation begins) for alternatives 3 and 4 different from that for alternative 2?	***Miscellaneous – Adaptive Management*** Pre-design sampling would follow the ROD. They are all similar in that regard.
13	Section 3.3			Discussion in Section 3.3 (Aquatic-dependent Wildlife RAO: Preliminary Remediation Goals) reasoned that it is not necessary to derive aquatic dependent wildlife-specific PRGs (separate from the surface water and benthic PRGs), because reductions in surface water and sediment PCB concentrations would result in a reduction of PCB concentrations in food items consumed by the sandpiper and the kingfisher. Please explain (a) how ~ 40% reduction in PCB concentrations in surface water and sediment was determined to reduce the highest hazard coefficient to 1.0 (or below) for the sandpiper and kingfisher (aquatic dependent wild life) and (b) how the wildlife hazard quotient will be verified; will verification occur after PCB concentrations in the system are reduced?	***Risk – Miscellaneous*** a. The hazard quotient (HQ) for the belted kingfisher is 1.7 and is the result of exposure to PCB dioxin-like toxic equivalents (in prey tissue (fish). This is the highest HQ for any of the aquatic-dependent wildlife and this HQ must be reduced by approximately 40% to reach an HQ of 1.0 (i.e., [1.7-1.0]/1.7 = 0.41). There is an apparent relationship between surface water and sediment PCB concentrations and fish tissue concentrations (i.e., a general increase in the downstream to upstream direction in Patrick Bayou up to station 060 – 070 and then a general decrease as you go farther upstream) as indicated in Draft FS Report figures 2-4, 2-18, and 2-20 through 2-22. Based on this apparent relationship, reductions in PCB concentrations in sediment (and porewater) and surface water should result in a commensurate reduction is fish tissue PCB concentrations. As described in Section 3.3 of the Draft FS Report, surface water concentrations have already dropped by a

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					factor of two to three times from 2009 to 2014, and are expected to decrease further as a result of natural recovery processes and implementation of the sediment remedy in SMA-1. Surface sediment concentrations also will decrease significantly as a result of natural recovery processes. Finally, the application of AC in SMA-2 through SMA-6 can reduce bioavailability of hydrophobic organic contaminants in porewater by more than 60 to 90%. It is anticipated that these remedial measures and ongoing natural recovery processes will reduce the bioavailability of PCBs for uptake into fish tissue by significantly more than the approximately 40% reduction required to reduce the belted kingfisher HQ to 1.0. b. Verification of reductions in PCBs in surface water, sediments, and porewater will be accomplished through the post-remedy monitoring program.
15	Section 3.4.2			In Section 3.4.2 (Protected Species Requirements), please specify that the Patrick Bayou is a habitat for many of the species found in the Galveston Bay. This section states that "…*the Site is approximately 11 miles upstream of Galveston Bay, which provides rearing, spawning, and adult habitat for numerous marine and estuarine fish and invertebrate species including blue crab, black drum, flounder, oysters, spotted sea trout, and shrimp, which are among the species identified as NOAA Trust resources.*" Please note that Patrick Bayou itself provides habitat for many of these species (many of these species have been collected within Patrick Bayou).	***Risk – Miscellaneous*** Habitat descriptions for Patrick Bayou can be found in several other USEPA-approved RI documents, including the *Preliminary Site Characterization Report* (Anchor 2006), BERA Work Plan (Anchor QEA 2011a), BERA Report (Anchor QEA 2013a), and the RI Report (Anchor QEA 2013b). Additional descriptions of habitat are not warranted in this section but references to these previous documents can be footnoted in Section 3.4.2 of the revised FS Report.

ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
AETs	Apparent Effects Threshold
ARARs	Applicable or Relevant and Appropriate Requirements
BEHP	bis (2-ethylhexyl) phthalate
BERA	Baseline Ecological Risk Assessment
BCF	bioconcentration factor
BTEX	benzene, toluene, ethylbenzene, xylene
COC	chemical of concern
COPC	chemical of potential concern
ERL/ERMs	Effects Range Low/Effects Range Median
FS	Feasibility Study
HQ	Hazard Quotient
JDG	Joint Defense Group
LOE	Line of Evidence
MNR	monitored natural recovery
ng/L	nanograms per liter
NPDES	National Pollutant Discharge Elimination System
NSR	net sedimentation report
PAH	polycylic aromatic hydrocarbons
PCB	polychlorinated biphenyls
PEC-Q	Probable Effects Concentration Quotient
PEL-Q	Probable Effects Level-Quotient
PRG	preliminary remediation goal
RAO	remedial action objective
RI	Remedial Investigation
ROD	record of decision
SEC	sediment effect concentrations
SMA	sediment management area
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TEL/PELs	Threshold Effects Level/Probable Effects Level
TSWQS	Texas Surface Water Quality Standards
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
WOE	weight of evidence

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